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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/379,753	08/24/1999	MICHAEL N. GRIMBERGEN	3948/USA/SIL	1675

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EXAMINER	
ZERVIGON, RUDY	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 08/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/379,753	GRIMBERGEN, MICHAEL N.
	Examiner	Art Unit
	Rudy Zervigon	1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 April 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-4,6-14,23-30,33-42,44-51 and 57-63 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-4,6-14,23-30,33-42,44-51 and 57-63 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-4, 11-14, 30, 33-35, 37-39, and 61-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giapis et al (USPat. 5,002,631) in view of Piwonka-Corle (USPat. 5,608,526). Giapis teaches a substrate etching apparatus (Figure 1; col. 3, lines 9-21) comprising a chamber (100) including:

i. A substrate support (110) to support a substrate (120)

ii. A gas distributor (102) to introduce an etchant gas into the chamber

iii. A gas energizer (140; column 3, lines 61-68) to energize the etchant gas

iv. A gas exhaust (103) to exhaust gas from the chamber

Giapis further teaches non-plasma radiation laser sources (161, 162), one of which (161) emerges from the chamber. Giapis further teaches one or more detectors (164, 165) to detect an intensity of a first radiation originating from the radiation source(s) and reflected from a substrate (120) or a chamber wall and generate sample signals (column 4, lines 40-49, 18-30). Inclusive, Giapis teaches:

i. A sample detector / first reference detector (164) to detect a first reference radiation from the plasma and generate a first reference signal ("systems...based on measurements" - column 4, lines 18-30). Applicant's additional requirement of "wherein the first reference radiation comprises a background radiation" is an intended use requirement. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention

generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). Further,

ii. A reference detector / second reference detector (165) to detect a second reference radiation (161) from the radiation source (161) and generate a second reference signal ("systems…based on measurements" - column 4, lines 18-30).

Giapis further teaches the detection (163) of an intensity of a second radiation (162) emitted from the radiation source and generate a reference signal (column 4, lines 40-49) at the second detector (163). Giapis further teaches the uniformity of wavelength between the first radiation reflected from the substrate and the second radiation (from the source 162) as per the "bifurcated fiber bundle 166" detected by one monochrometer detector 163. The depth an uniformity of Giapis' etch are monitored by laser scattered by the wafer (column 5, lines 20-23).

Giapis does not teach:

i. a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal

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Piwonka-Corle teaches an ellipsometry apparatus (Figure 12) for substrate analysis (column 3, lines 9-20). Specifically, Piwonka-Corle teaches:

ii. a signal analyzer (100; column 15, lines 9-23; Figure 12) adapted to normalize the sample signal (9) relative to the reference signal ("reference beam") by mathematically operating on the sample signal with the reference signal to generate a normalized signal ("is programmed to normalize"), and determine a thickness of a layer on a substrate from the normalized signal It is inherent that Piwonka-Corle's signal analyzer normalization apparatus compensates for fluctuations in reflected radiation and background radiation. Specifically, Piwonka-Corle teaches that the signal analyzer (100; column 15, lines 9-23; Figure 12) is programmed to normalize (column 15, line 15) specifically for "intensity fluctuation" compensations (column 15, line 18). Inclusive, that Piwonka-Corle teaches background radiation compensation during signal processing is supported by Piwonka-Corle's very teaching of polychromatic collection and monochromatic analysis of said specific sample radiation signal, i.e. wavelength (column 11, line 60 – column 12, line 8).

Applicant's claim 61 claim limitations of:

"

(a) before the gas energizer energizes the etchant gas, measuring the sample and reference signals,

(b) after the gas energizer energizes the etchant gas but before substantially etching has occurred, measuring the sample signal, and

(c) during etching, measuring the sample and reference signals, whereby a thickness of a layer being etched on the substrate or chamber wall" are requirements of intended use of the claimed apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter

, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Applicant's claim 62 claim limitations of "the background radiation comprises...", and the entirety of claim 63 are requirements of intended use of the claimed apparatus claims. See above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giapis to use Piwonka-Corle's signal analyzer to determine a thickness of a layer on a substrate from the normalized signal

Motivation for Giapis to use Piwonka-Corle's signal analyzer to determine a thickness of a layer on a substrate from the normalized signal is to determine film thicknesses more accurately (column 15, lines 10-15).

3. Claims 6-10, and 23-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giapis et al (USPat. 5,002,631) and Piwonka-Corle (USPat. 5,608,526), in view of Cates et al (USPat. 5,328,517). Giapis and Piwonka-Corle are discussed above. Giapis and Piwonka-Corle do not teach a signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization.

Cates teaches an apparatus for removing material from a substrate (column 3, lines 21-44). Cates further teaches a similar photodetecting system and associated components (column 3, lines 44-65). Specifically, Cates teaches:

iii. a signal analyzer (148; column 15, line 44 – column 16, lines 10) adapted to normalize the sample signal ("signals received in each data channel") relative to the reference signal (18'; Figure 8; column 15, lines 60-68) by mathematically operating (column 18) on the sample signal with the reference signal to generate a normalized signal (column 16, lines 5-10)

iv. a signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization (column 18, lines 30-45)

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giapis and Piwonka-Corle to reprogram Piwonka-Corle's signal analyzer in the manner of Cates' signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization.

Motivation for Giapis and Piwonka-Corle to reprogram Piwonka-Corle's signal analyzer in the manner of Cates' signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization is to generate Cate's weighted sum average (column 18, lines 24-43).

4. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Giapis et al (USPat. 5,002,631) and Piwonka-Corle (USPat. 5,608,526), in view of Taketora Saka (JP01260304). Giapis and Piwonka-Corle are discussed above. However, Giapis and Piwonka-Corle do not teach a lens to focus the reference radiation from the radiation source onto the first fibers. Taketora Saka shows a lens (6) in Taketora Saka's Figure focusing radiation between the reference radiation (3) and the substrate (1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giapis and Piwonka-Corle to use Taketora Saka's lens to focus the reference radiation from the radiation source onto the first fibers.

Motivation for Giapis and Piwonka-Corle to use Taketora Saka's lens to focus the reference radiation from the radiation source onto the first fibers is drawn to the level of ordinary skill in the art whereby lens optics are known to focus, i.e. concentrate, light rays thereby increasing the radiations intensity to a small area.

5. Claims 40-42, 44-51, and 57-59 are rejected under 35 U.S.C. 103(a) as being anticipated by Giapis et al (USPat. 5,002,631) in view of Ish-Shalom (USPat. 6,299,346) and Moslehi (USPat. 5,156,461). Giapis is discussed above. However, Giapis does not teach a feedback controller adapted to regulate a power level of the radiation source in relation to the detected intensity of the second radiation. Ish-Shalom teaches fiber optic (24, Fig.2a) spectroscopy of a wafer (10). Ish-Shalom additionally teaches a chamber (14) comprising an electro-optical shutter (23) modulated (column 10, lines 40-45) radiation source (28), first (32) and second (34) detectors for detecting an intensity of a first radiation reflected (column 9, lines 20-39) from a substrate and the detection of an intensity of a second radiation from the radiation source.

Ish-Shalom does not teach a controller (36) having feedback capacity adapted to regulate a power level of the reference radiation (28).

Moslehi teaches a controller (126; Figure 15) having feedback capacity (136, 132; Figure 15) adapted to regulate a power level of a reference radiation (134; Figure 15; column 6, lines 16-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made

for Giapis to use Ish-Shalom's components and Moslehi's feedback controller adapted to regulate a power level of a reference radiation.

Motivation for Giapis to use Ish-Shalom's components and Moslehi's feedback controller adapted to regulate a power level of a reference radiation is to allow correction for electronic drifts as taught by Giapis (column 11, lines 1-18) and for wafer attribute control as taught by Moslehi (column 6; lines 57-65).

6. Claim 60 is rejected under 35 U.S.C. 103(a) as being anticipated by Giapis et al (USPat. 5,002,631), Ish-Shalom et al (USPat. 6,299,346), and Moslehi (USPat. 5,156,461) in view of Piwonka-Corle (USPat. 5,608,526). Giapis, Ish-Shalom, and Moslehi are discussed above. However, Giapis, Ish-Shalom, and Moslehi do not teach

v. a signal analyzer adapted to normalize the sample signal relative to the reference signal by mathematically operating on the sample signal with the reference signal to generate a normalized signal, and determine a thickness of a layer being etched on the substrate or chamber wall from the normalized signal.

Piwonka-Corle teaches an ellipsometry apparatus (Figure 12) for substrate analysis (column 3, lines 9-20). Specifically, Cates teaches:

vi. a signal analyzer (100; column 15, lines 9-23) adapted to normalize the sample signal (9) relative to the reference signal ("reference beam") by mathematically operating on the sample signal with the reference signal to generate a normalized signal ("is programmed to normalize"), and determine a thickness of a layer on a substrate from the normalized signal

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Giapis, Ish-Shalom, and Moslehi to use Piwonka-Corle's signal analyzer to determine a thickness of a layer on a substrate from the normalized signal

Motivation for Giapis, Ish-Shalom, and Moslehi to use Piwonka-Corle's signal analyzer to determine a thickness of a layer on a substrate from the normalized signal is to determine film thicknesses more accurately (column 15, lines 10-15).

Response to Arguments

7. Applicant's arguments filed April 23, 2004 have been fully considered but they are not persuasive.

8. The objections to claims 61 and 63 are removed in light of Applicant's amendment.

9. In advance, the Examiner inadvertantly left out claim 34 from the rejections under 35 U.S.C. 103(a) as being unpatentable over Giapis et al (USPat. 5,002,631) in view of Piwonka-Corle (USPat. 5,608,526) and from the list of pending claims in PTOL-326 as stated in the prior action. The Examiner has corrected this error in the present action. For this reason, the present action is made non-final

10. Applicant states that the Examiner relies on the Piwonka-Corle citation of

"

each photodiode in array 136 measur[ing] radiation of a different wavelength (column 11, lines 60-61)

"

as a sole rationale to support the teaching by Piwonka-Corle for compensating for background radiation. The Examiner disagrees. The Examiner specifically stated that Piwonka-Corle teaches

that the signal analyzer (100; column 15, lines 9-23; Figure 12) is programmed to normalize (column 15, line 15) specifically for "intensity fluctuation" compensations (column 15, line 18). Inclusive, that Piwonka-Corle teaches background radiation compensation during signal processing is supported by Piwonka-Corle's very teaching of polychromatic collection, as cited by Applicant, [and] monochromatic analysis of said specific sample radiation signal, i.e. wavelength (column 11, line 60 – column 12, line 8).

Applicant further states:

"

To compensate for background radiation during normalization is not inherent in the disclosure of Piwonka-Corle because, inter alia, the processor of Piwonka-Corle is not disclosed as being programmed to perform such compensation.

" To the contrary, the Examiner believes that the Piwonka-Corle disclosure supports Applicant's claimed data collection and analysis. For example, Piwonka-Corle specifically teaches that his processor 100 is configured to conduct background radiation compensation processing during normalization processing:

"processor 100 is programmed to normalize the reflectivity measured by sample beam 9 <u>using</u> the reference beam measurements from detector 273, <u>to compensate</u> for such effects as lamp intensity fluctuations and air currents."

Piwonka-Corle goes even further in teaching compensation during normalization by considering transient compensation and using a reference signal or "reference channel":

"

If such effects are time varying (during the time scale of a single sample measurement) they can affect the measurement unless compensated for by use of a reference channel (such as that of FIG. 12 in which beam 109 propagates to detector 273).

"

Applicant further states:

"

Giapis at al does not teach one or more first fibers to transmit radiation from the radiation source to the reference detector. Giapis et al furthermore is silent on the arrangement of the branches of the bifurcated fiber bundle in respect to the radiation source.

"

To the contrary, it was conveyed that Giapis indeed teaches one (fiber element within "fiber bundle 166" that attaches to laser 162; Figure 1) or more first fibers to transmit radiation from the radiation source (162) to a detector (163). Giapis et al furthermore supports a specific arrangement (Figure 1 – "bifurcated fiber bundle") of the branches (see "Y" intersection) of the bifurcated fiber bundle in respect to the radiation source (162).

With respect to Applicant's arguments regarding the Cates reference, Applicant's arguments are addressed above in view of the arguments under Giapis et al (USPat. 5,002,631) in view of Piwonka-Corle (USPat. 5,608,526). Further, Cates is cited to teach the difficiencies of Giapis et al and Piwonka-Corle which is a signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization. Here, Cates was cited for teaching:

"

a signal analyzer (148; column 15, line 44 – column 16, lines 10) adapted to normalize the sample signal ("signals received in each data channel") relative to the reference signal (18'; Figure 8; column 15, lines 60-68) by mathematically operating (column 18) on the sample signal with the reference signal to generate a normalized signal (column 16, lines 5-10)

a signal analyzer that performs the normalization by assigning a specific mathematical algorithm for the normalization (column 18, lines 30-45)

"

Applicant, on page 21, traverses the claim 36 rejection under 35 U.S.C. 103(a) as being unpatentable over Giapis et al (USPat. 5,002,631) and Piwonka-Corle (USPat. 5,608,526), in view of Taketora Saka (JP01260304). However, Applicant proposes arguments for claim 30, not claim 36. The rejection of claim 30 is Giapis et al (USPat. 5,002,631) in view of Piwonka-Corle (USPat. 5,608,526) and does not include Taketora Saka (JP01260304). Further, Applicant's arguments for assumed claim 36 are arguments not directed to the contents of claim 36: "Giapis and Piwonka-Corle do not teach a lens to focus the reference radiation from the radiation source onto the first fibers. Taketora Saka shows a lens (6) in Taketora Saka's Figure focusing radiation between the reference radiation (3) and the substrate (1).". However, regarding the optical fibers argument, it was already establsihed above that Giapis teaches "bifurcated fiber bundle 166" detected by one monochrometer detector 163.

Applicant rebutts the Ish-Shalom reference:

"

Ish-Shalom et al. teaches a control system that "provides incident radiation (40) intermittently by turning radiation source (28) on and off." This is different from the feedback controller of claim

40 because the control system does not regulate the radiation source power level "in relation to" a detected intensity of a second radiation or a reference signal. The "control system" turns the radiation source on and off at a predefined constant rate, whereas the recited "feedback controller" regulates the power level variably "in relation to the intensity" measured in real-time.

"

The Examiner disagrees. Ish-Shalom was cited for teaching a feedback controller (36) adapted to regulate a power level (column 11, lines 8-15) of a reference radiation (28). Ish-Shalom teaches Applicant's feedback controller (36) of claim 40 because the control system (36, 38; Figure 2A) does regulate the radiation source (28) power level (power "on" or power "off "; column 11; lines 8-18) "in relation to" a detected intensity (32; 34; Figure 2A) of a second radiation (42, 44 – see sets of arrows above and below; Figure 2A) or a reference signal. That Ish-Shalom's controller is a feedback controller is drawn from Ish-Shalom's discussion (column 11, lines 8-18). Here, the "signals" from detectors 32 and 34 alternate between reflected + emitted radiation and emitted radiation thereby providing processor 38 and controller 36 with signals to regulate radiation source (28).

In response to applicant's argument that there is no suggestion to combine the references of Giapis et al (USPat. 5,002,631) in view of Ish-Shalom et al (USPat. 6,299,346), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is

teaching, suggestion, and motivation to combine the references found in the references themselves: "Motivation for Giapis to use Ish-Shalom's feedback controller adapted to regulate a power level of a reference radiation is to allow correction for electronic drifts as taught by Ish-Shalom (column 11, lines 1-18)."

With regard to specific arguments regarding the Ish-Shalom reference, Applicant's arguments are moot in view of the new grounds of rejection.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

4/18/4